

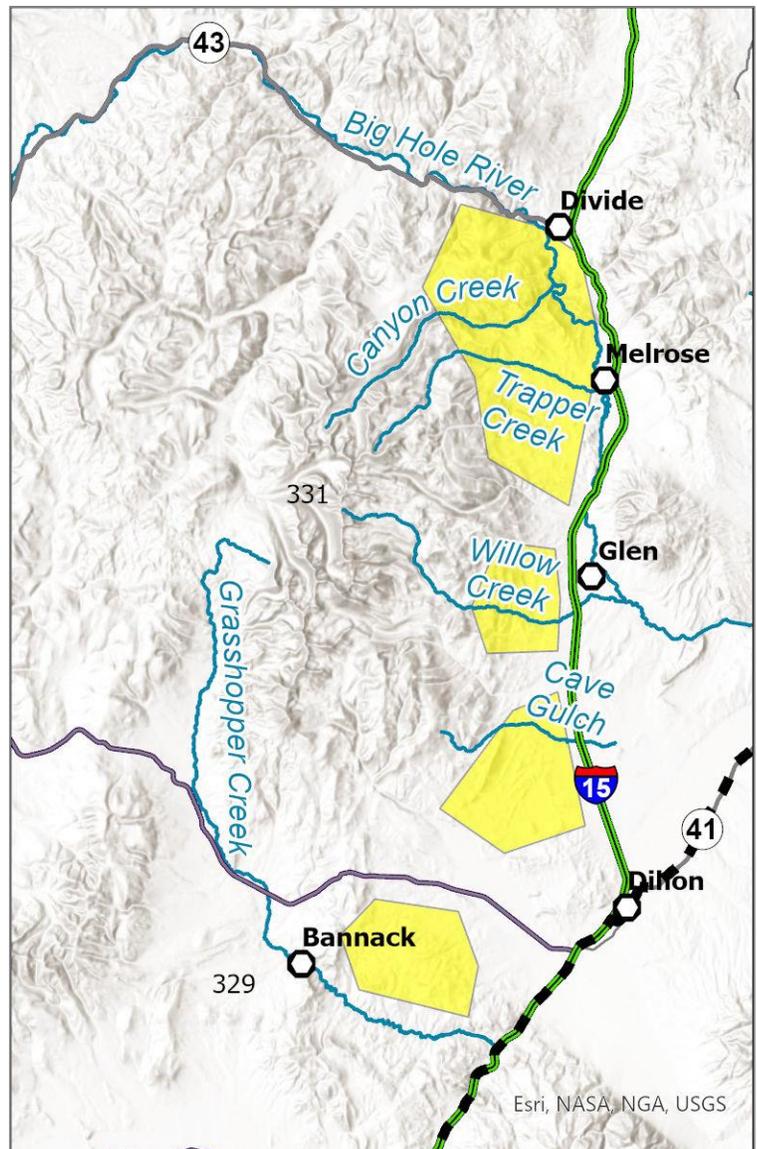


Targeted Elk Brucellosis Surveillance Project 2023 Post-Capture Report Pioneer Mountains

BRUCELLOSIS SURVEILLANCE

To increase understanding of brucellosis in elk herds, MFWP initiated a targeted elk brucellosis surveillance project in 2011. Sampling efforts are focused on 1 – 2 elk herds every year. Elk in targeted herds are captured and sampled to evaluate the spatial extent of brucellosis exposure in elk herds. GPS radio collars are deployed on a subset of elk to document elk movements, the extent of spatial overlap with livestock, and interchange between elk herds. This winter, elk capture and sampling efforts for the project occurred January 16–22nd in the eastern (HD331) and southeastern (HD329) portions of the Pioneer Mountains (Figure 1).

Figure 1. Elk brucellosis surveillance was conducted in the eastern (HD331) and southeastern (HD329) portions of the Pioneer Mountains. The Montana Department of Livestock brucellosis designated surveillance area (DSA) is shown as a black dotted line.



Pioneer Mountains

A total of **149 female elk** were captured and sampled in the Pioneer Mountains study area (HD331 and HD329) from January 16-22nd (Figure 2). During captures, we obtained blood serum samples for brucellosis testing. Of these, **0 tested seropositive for exposure to brucellosis**, giving the study area an estimated seroprevalence of 0 (95% confidence interval: 0 – 2.5%; Table 1). Future summaries of brucellosis seroprevalence will be reported at the hunting district level.

Of the captured animals, 30 female elk were fitted with GPS collars programmed to collect hourly locations for the next year (Figure 3). An automatic release mechanism will drop the collars for retrieval on 3/22/2024. Blood serum from 29 collared females was tested for pregnancy, with 26 classified as pregnant based on the level of PSPB (a pregnancy-specific protein which is released in higher quantities when a fetus is present) found in their blood. The percentage of pregnant adults in the Pioneer Mountains study area (90%) is slightly above the state-wide average (86%).

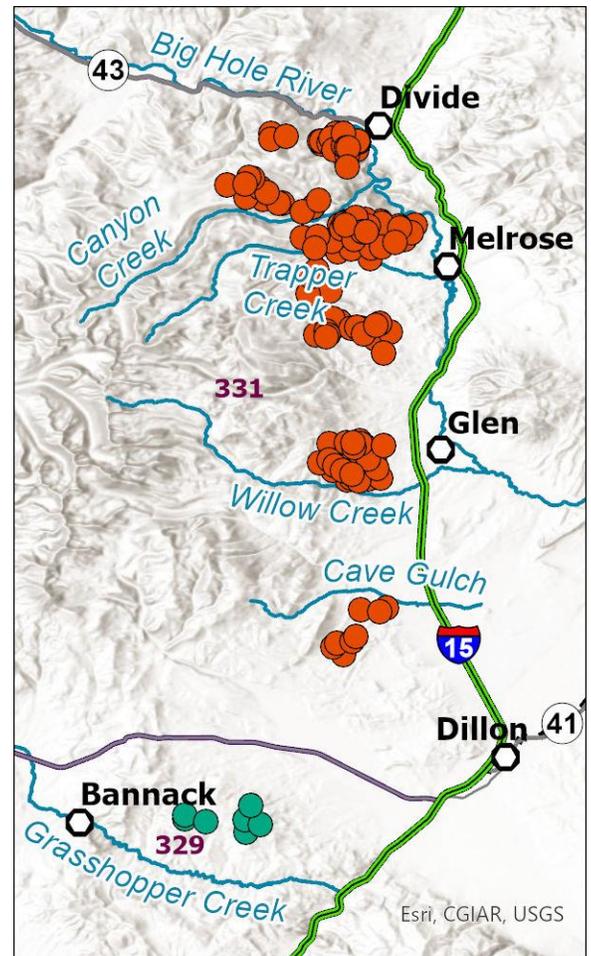


Figure 2. Capture locations of elk from HD331 (orange) and HD329 (teal) in the Pioneer Mountains northwest of Dillon, MT during January 2023.



Serology

Blood serum samples from 28 adult female elk were assayed for evidence of exposure to pathogens including *Anaplasma* bacteria, Leptospirosis, parainfluenza-3 (PI-3), bovine respiratory syncytial virus (BRSV), bovine viral diarrhea type 1, bovine viral diarrhea type 2 (BVD 1 and 2), bovine herpesvirus-1 (BHV-1), and epizootic hemorrhagic disease (EHD). These pathogens were selected for screening because of their potential to influence individual or herd health in wildlife and/or livestock. All assays were conducted by the Montana Veterinary Diagnostic Laboratory (MVDL; Bozeman, Montana). Evidence for exposure varied by pathogen (Table 1). A brief description of each pathogen and its influence (if known) on individual or herd health can be found below.

Table 1: Seroprevalence of brucellosis (BRUC), anaplasmosis (ANAPL), leptospirosis (LEPTO), parainfluenza-3 (PI3), bovine respiratory syncytial virus (BRSV), bovine viral diarrhea type 1 (BVD 1), bovine viral diarrhea type 2 (BVD 2), bovine herpesvirus-1 (BHV-1), and epizootic hemorrhagic disease (EHD) based on serological screening of adult female elk in the Pioneer Mountains study area during the winter of 2023.

Statistic	BRUC	ANAPL	LEPTO	PI3	BRSV	BVD 1	BVD 2	BHV-1	EHD
# Sampled	149	28	28	28	28	28	28	28	28
# Exposed	0	15	0	21	0	4	0	15	0
% Exposed	0	54	0	75	0	14	0	54	0

Brucellosis

Brucellosis is a zoonotic infectious disease caused by the *Brucella abortus* bacterium affecting some elk herds in the Greater Yellowstone Area. The presence of this disease in Montana elk herds is primarily a concern because infected elk can act as a reservoir for transmission to livestock, and the disease is highly regulated in livestock because of zoonotic risk to humans. Naive elk and cattle may experience a high rate of abortion (Thorne et al. 1978); however, brucellosis is not considered a direct threat to the sustainability of elk herds in Montana. We found no serological evidence of exposure to brucellosis in female elk sampled in the Pioneer Mountains study area.

Anaplasmosis

Anaplasmosis is a zoonotic tick-borne disease caused by bacteria of the genus *Anaplasma* that primarily affects domestic cattle. *Anaplasma marginale*, the species most commonly involved with infections in cattle, affects red blood cells resulting in severe anemia and sometimes death. Elk are susceptible to *Anaplasma* infection, however, serious clinical signs have not been recorded and there is little evidence suggesting elk are important

carriers or reservoirs of the disease (Kuttler 1984; Zaugg et al. 1996). We found serological evidence of exposure to *Anaplasma* in 54% of female elk sampled in the Pioneer Mountains study area. The specific *Anaplasma* species the elk were exposed to are unknown because the test detects antibodies for multiple species. This pathogen is not expected to impact individual or herd health in elk.

Leptospirosis

Leptospira spp. are a group of several closely related bacteria that can infect nearly all mammals. Infection varies in severity from asymptomatic to fatal depending on the host and the serological variant of *Leptospira*. Naturally occurring *Leptospira* infections in wildlife are usually asymptomatic, but may result in renal failure, lysis of red blood cells, fever, inappetence, hemorrhages on mucous membranes, jaundice, dehydration, infertility, abortion, stillbirths, or weakened neonates. *Leptospira* infection is generally not considered to be of concern in herds of free-ranging elk but has been widely studied in wildlife due to the possibility of transmission to domestic livestock (Thorne et al. 2002). *Leptospira spp.* infection may cause some mortality; however, clinical disease in wildlife is rare and not likely a major limiting factor in free-ranging elk herds (Thorne et al. 2002). We found no serological evidence of exposure to *Leptospira spp.* in female elk sampled in the Pioneer Mountains study area.

Parainfluenza-3

Parainfluenza-3 (PI3) is a common virus that can be involved in respiratory disease in domestic ungulates. The disease associated with PI3 is usually mild or subclinical, but under severe stress, the virus may predispose animals to coinfection with other respiratory pathogens resulting in development of secondary bacterial pneumonia. It is unknown whether exposure to this virus leads to clinical symptoms in free-ranging elk (Barber-Meyer et al. 2007). Evidence of exposure on serological testing is common in wildlife but documented clinical cases of disease are not. We found a seroprevalence of 75% in female elk sampled in the Pioneer Mountains study area; however, exposure to this virus is not expected to impact individual or herd health.

Bovine respiratory syncytial virus

Bovine respiratory syncytial virus (BRSV) can be a primary pathogen causing varying degrees of pneumonia, especially in young calves. Disease is often most severe when secondary bacterial infection occurs. Elk are susceptible to infection by the virus, which is most likely transmitted from cattle; however, serious clinical symptoms may not occur in wild elk (Barber-Meyer et al. 2007). We found no serological evidence of exposure to BRSV in female elk sampled in the Pioneer Mountains study area.

Bovine viral diarrhea (types 1 & 2)

Bovine viral diarrhea (BVD) virus (types 1 & 2) can cause bloody diarrhea and can induce immunosuppression resulting in development of secondary bacterial pneumonia in domestic and wild ungulates. The different types (1 & 2) reflect differences in the antigens found on the viral surface protein and do not relate to the virulence of the virus. Elk are susceptible to infection with BVD, but there is little evidence of serious clinical effects (Tessaro et al. 1999). There is potential for wildlife herds to serve as reservoirs of this virus (Duncan et al. 2008). We found serological evidence of exposure to BVD Type 1 in 14% of female elk sampled in the Pioneer Mountains study area. We found no serological evidence of exposure to BVD Type 2.

Bovine herpes virus-1

Bovine herpes virus-1 (BHV-1) is a common virus in cattle and can cause rhinotracheitis, fever, conjunctivitis, a drop in milk production, abortion, encephalitis, and lesions of the mucous membranes of the genital tract. The virus is transmitted most effectively by respiratory infections (Wentink et al. 1993). While most BHV-1 infections in cattle are mild, the virus can predispose animals to secondary bacterial pneumonia. BHV-1 can undergo long periods of latency before being reactivated, when it can again be shed and infect new hosts. We found serological evidence of exposure to BHV-1 in 54% of female elk sampled in the Pioneer Mountains study area.

Epizootic hemorrhagic disease

Epizootic hemorrhagic disease (EHD) is caused by a virus that is transmitted by biting midges in the *Culicoides* genus and other arthropods. EHD can cause acute and frequently fatal hemorrhagic disease in domestic and wild ungulates. Recurrent outbreaks of EHD-associated mortality occur in white-tailed deer and mule deer, primarily in southeastern Montana (Montana Fish, Wildlife and Parks Wildlife Health Lab, unpublished data). Elk are susceptible to EHD, but generally do not suffer high rates of mortality or show clinical symptoms (Hoff and Trainer 1973; Nol et al. 2010). There is some concern that elk could act as reservoirs of EHD and transmit the virus to other wildlife (Thorne et al. 2002), but such relationships are not well studied. Epizootic hemorrhagic disease virus exposure was not detected in sampled female elk in the Pioneer Mountains study area.

Monitoring Efforts

We are currently monitoring 30 collared elk in the Pioneer Mountains. A map of animal movements to date is shown below.

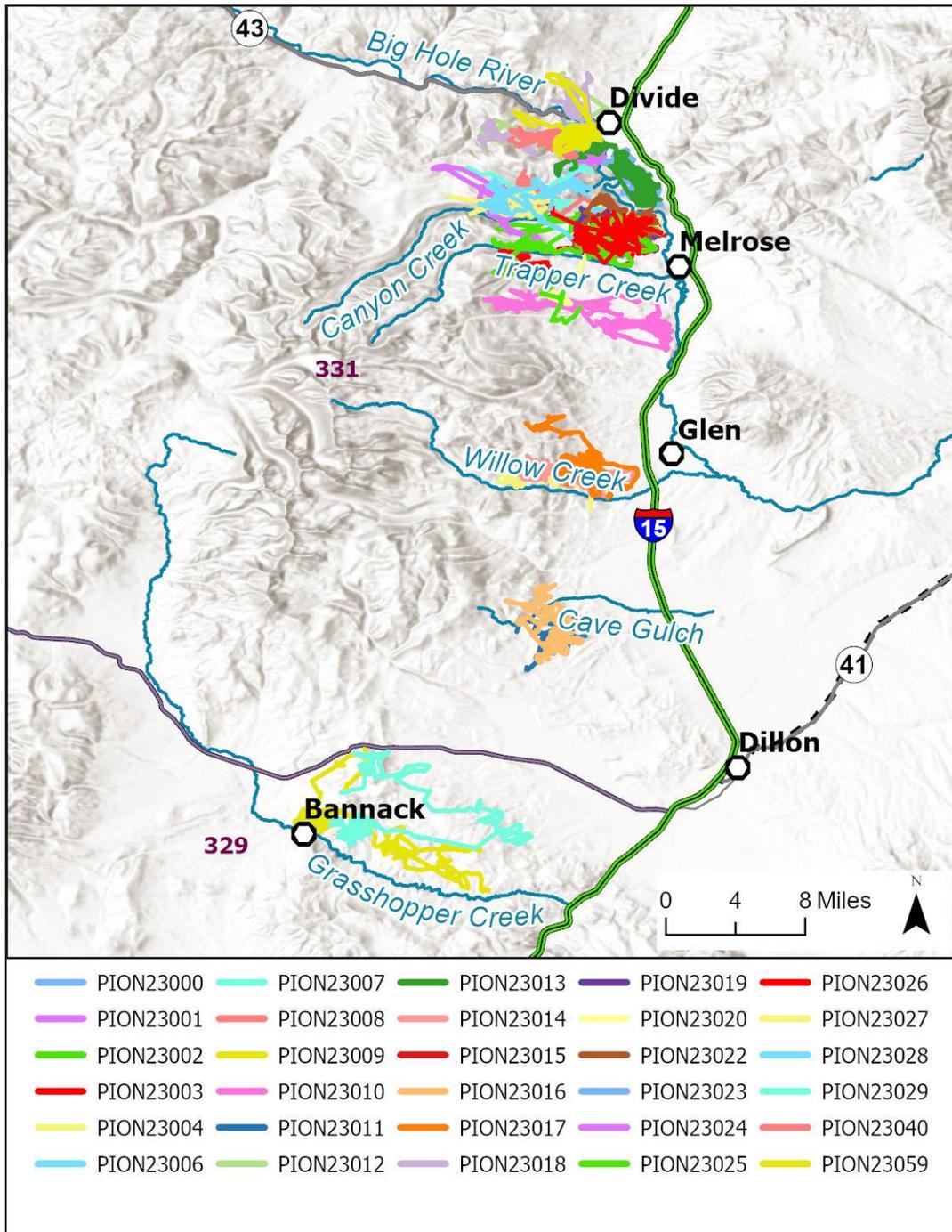


Figure 3. Lines showing movement since capture of collared female elk in the Pioneer Mountains.

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